Chapter 5

Deliver Fires

This chapter focuses on execution - the delivery of fires. The chapter has five sections. Section I covers the fire mission process, including tactical and technical FD, massed fires, and continuity of operations. Section II discusses various types of special fire missions. Section III provides information on counterfire, to include support for theater missile defense. Section IV discusses FA support for SEAD operations. Section V provides general information on FA meteorological operations.

SECTION I – FIRE MISSION PROCESSING

5-01. FA functions directly associated with the delivery of fires are encompassed in the fire mission process. The delivery of FA fires depends on:

- Accurately locating an appropriate target (TA process).
- Initiating a call for fire into the FS system (the fire request).
- Analyzing the fire mission to determine the proper method of attack (tactical FD in FSEs, force FA HQs, and battalion and battery FDCs).
- Converting the call for fire into gun data (technical FD in battery/platoon FDCs and on newer weapon systems like Paladin and MLRS).
- Delivering the required ordnance on the target to meet the needs of the supported commander (deliver fires).
- Determine and report BDA.

5-02. Whether this process is done manually or through an automated system the process is the same. Automating fire control does not change what we do but how we do it. The basic fire mission flow is shown in the DS example in Figure 5-1.

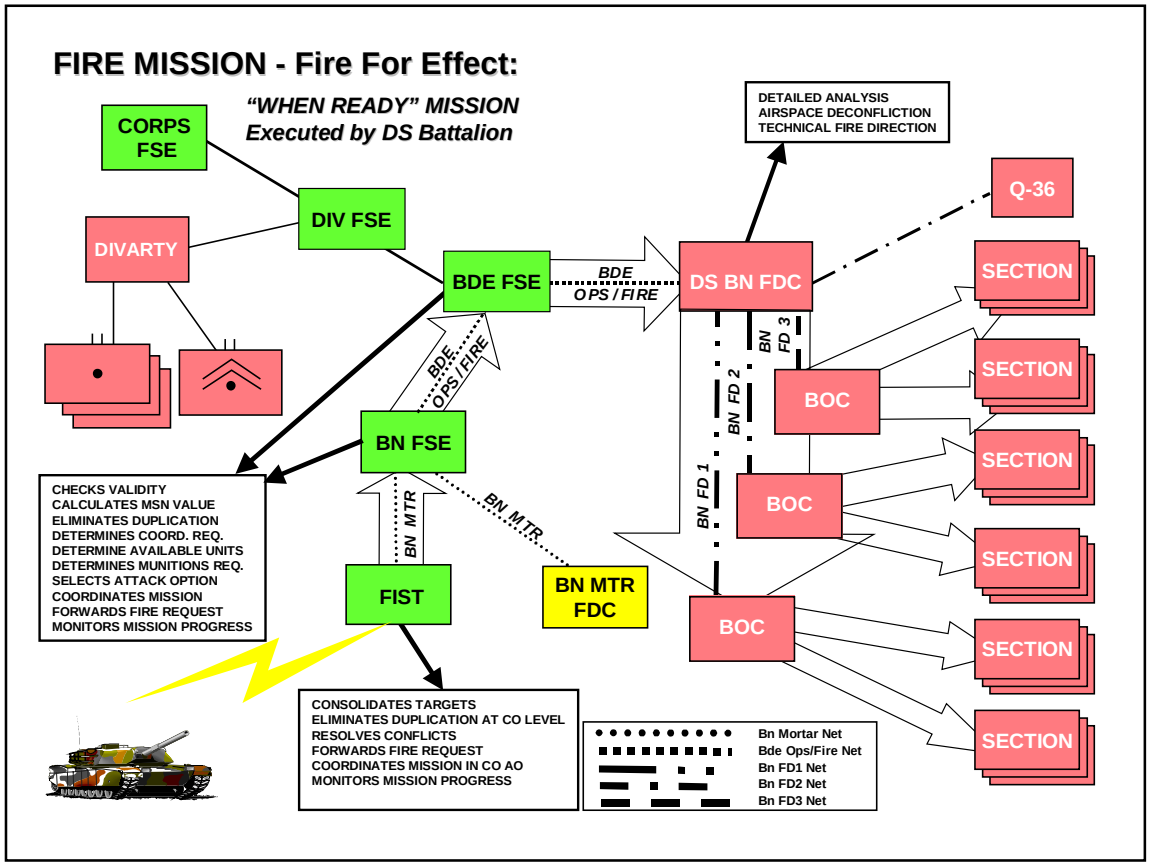

Figure 5-1. Fire Mission Flow (DS Example)

5-03. To expedite fires, the unit can coordinate the use of various quickfire linkages, designed to facilitate rapid fire mission execution, while achieving desired control. For example, in Figure 5-2, a quickfire channel could be established from a FIST, through the Bn FSE, and then directly to the Bn FDC. Or for even faster response and more decentralized control, the FIST may send the mission directly to the BOC or POC that will execute the mission. This is often used for priority targets and FPFs. Quickfire channels can be used for any observer or sensor, such as the radar shown in the figure. Any FSE or FA CP that is normally in the fire mission flow, but is bypassed during quickfire operations, should receive a notification of each fire mission through message of interest processing. While the example is of a DS FA battalion, the technique can be used to expedite fires to any FA unit.

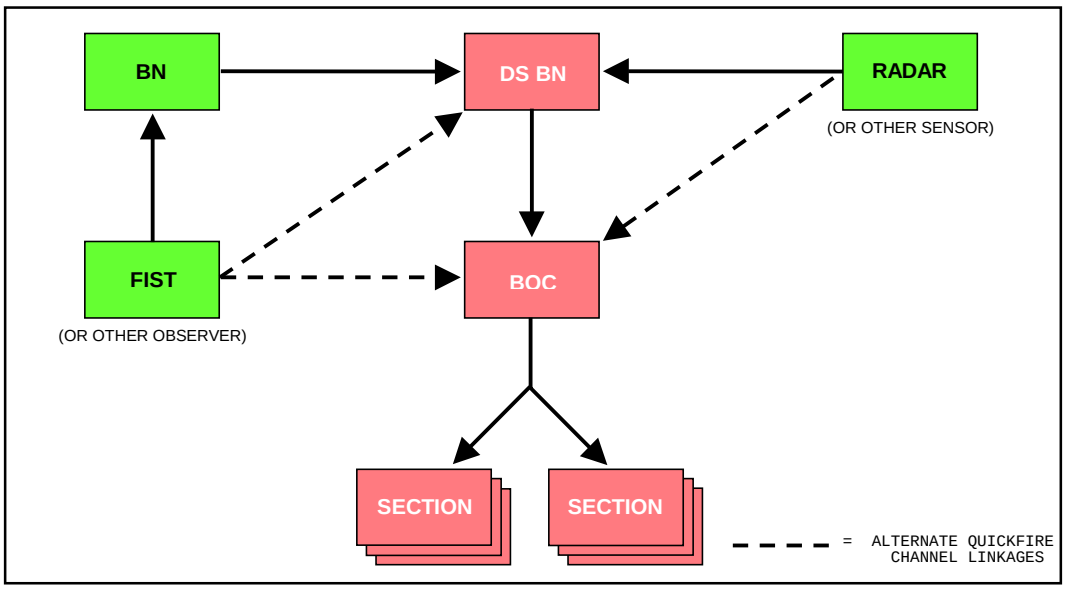

Figure 5-2. Quickfire Channel Example

FIRE MISSION REQUESTS

5-04. Units plan and execute FA fires digitally, as much as possible. However, FA battalions may receive planned and non-planned missions from a wide variety of sources, in both voice and digital formats. They may have been generated at lower or higher echelon maneuver, FS, or FA elements. They may have been routed through several elements in the FS/FA system or arrived in a battalion or battery FDC directly from the requestor.

DIGITAL

5-05. Digital fire missions may be received from FA and non-FA digital systems. Procedures and capabilities may vary depending on which digital systems are interfacing with one another. FA battalion commanders face two major challenges in the digital arena:

- Maintaining technical expertise in a rapidly changing hardware/software environment. Each new/upgraded device and software version brings new capabilities, procedures, problems, and workarounds.
- Finding digital training opportunities involving digital equipment that the unit does not possess (e.g., AFATDS to IFSAS communications).

5-06. Training opportunities should be aggressively sought out. Digital, FA technical support rehearsals should thoroughly address digital interface issues and possibilities. Whenever possible, critical digital fire missions should be rehearsed along the entire sensor-to-shooter link, under the same digital conditions anticipated for the actual operation (extended communications distances, surge digital traffic capacity, degraded operations, alternate routes). For DS battalions this involves significant coordination responsibilities for both FS and FA digital operations.

VOICE

5-07. Use of voice may be especially effective for unplanned, immediate fire requests, or during adverse communications conditions. FDCs must anticipate the circumstances and the types of voice missions they may encounter. The tactical solution and effects on the target should be essentially the same regardless of whether the mission was processed voice or digital. Missions involving FS personnel, radars, and other FA elements are usually easy to handle. However, missions from non-FA personnel may require innovative solutions to coordination, communication, and clearance of fire.

UNTRAINED OBSERVERS

5-08. Occasionally the FA battalion may need to process fire missions from untrained observers. Often these are critical requests where the requestor is under fire. This is a battle drill that needs to be practiced. Specific members of the battalion and firing battery FDCs should be identified as the primary handlers of untrained observer missions. These personnel should possess good communications skills, patience combined with a sense of urgency, and the ability to remain calm in stressful situations. These individuals should be identified during training and given the opportunity to practice untrained observer missions during major training exercises. FM 6-40 contains a detailed explanation of untrained observer procedures.

TACTICAL FIRE DIRECTION

5-09. The battalion FDC performs the tactical FD functions. It is the process that results in a fire order. A fire order is the FDO's decision, under supervision of the S3, on whether and how to attack a target. The FDO considers the following:

- Location of the target. Is it cleared to fire? Is it within range? Can the target be attacked?
- Nature of the target. How large is it? What is its degree of protection?
- Ammunition available. What do the batteries have on hand to fire?
- Firing units available. Who is in range and ready to fire?
- Maneuver commander's guidance and/or TSOP. What do we want to do to the target?
- Request for fire. What did the observer ask for? Can the battalion give it to him? Should the battalion give it to him?
- Munitions effects. Given the ammunition available, nature of the target and commander's guidance, how should the target be attacked?
- Tactical situation. When should the battalion fire? Are special instructions required?

5-10. The objectives of tactical FD are as follows:

- Provide continuous accurate and responsive FS under all conditions.
- Maintain the flexibility to engage all targets types over wide frontages.
- Mass the fires of all available units quickly.
- Engage a number and variety of targets simultaneously.

CENTRALIZED CONTROL

5-11. Centralized tactical fire control may be used when there are few firing units, when ammunition is low, during critical operations where the commander needs to carefully control operations, or when restrictive rules of engagement are in place. Under maximum centralized control, all fire requests go through the brigade FSE and FA battalion FDC. Also, AFATDS intervention point rules and commander's guidances are restrictive. Most missions are stopped for review at each OPFAC (as a minimum at the brigade FSE and battalion FDC), with only pre-designated critical missions flowing automatically through the fire control system.

DECENTRALIZED CONTROL

5-12. Decentralized tactical fire control (TFC) is used when maximum responsiveness and speed of execution is necessary. Some degree of decentralized control may be used even when resources are scarce if the maneuver commander (with input from his FSCOORD) determines the risks inherent in reduced control are warranted.

5-13. Decentralized control involves the use of sensor-to-shooter linkages and quickfire channels that may bypass some or all of the normal intervening OPFACs. Another method is to modify the AFATDS intervention rules and commander's guidances so that most missions flow through intervening OPFACs without stopping.

5-14. With decentralized control, FA battalion commanders and S3s must more closely monitor ammunition expenditures and the number of rounds fired from current positions. The potential for ammunition shortages and forced survival moves may increase under decentralized control procedures.

QUICKFIRE CHANNELS

5-15. When significantly responsive fires are necessary, a quickfire channel may be established. This may be a voice or digital link. The quickfire channel can be established as a direct link between the sensor (observer) and the shooter, or it may have one or more intervening C2 elements that evaluate and or relay traffic. Quickfire channels can be established using existing nets, with the only changes being in the actual routing or reporting of information. Establishment of quickfire channels may also involve the use of alternate nets or communications methods.

5-16. Quickfire channels are sometimes used in the following instances:

- Counterfire – to link a radar and a firing unit.
- SEAD/TMD – to link an EW/intelligence asset or an aircraft with a firing unit.
- Immediate suppression – to link a FO/COLT/Striker or other observer with a designated firing unit.
- Deep operations – to link scarce, time blocked EW and intelligence assets such as UAVs with firing units to find and immediately attack specific targets or target types.

5-17. Quickfire channel situations may involve supplementing the FA battalion with special communications equipment or coordinating

nonstandard digital communications protocols. The S6 plays a critical role in identifying and evaluating EFATs involving quickfire channels. Wargaming and rehearsals require detailed analysis, as testing of the communications links may not be possible until during or immediately prior to the event. Requesting lessons learned information from other units that performed similar operations can prove extremely beneficial in identifying potential problems that can not otherwise be caught during planning and rehearsal.

AUTOMATED TACTICAL FIRE DIRECTION

5-18. The delivery of FA fires is significantly enhanced through the use of AFATDS, IFSAS, FDS, and LTACFIRE. These automation systems digitally link the FA battalion with its force FA HQ and adjacent, subordinate, reinforced, and supported units. The systems automate tactical FD and planning functions. AFATDS, IFSAS, FDS, and LTACFIRE can process and disseminate the following:

- Conventional fire plans.
- Target information.
- Fire missions generated from incoming target intelligence (tactical FD).
- FSCMs and other forms of battlefield geometry.
- Ammunition and fire unit data.
- Messages of interest to other OPFACs.
- Met and survey data.
- OPLANs/OPORDs, FS estimates, wargaming, graphics, and matrixes (AFATDS only).
- Movement control and logistics management (AFATDS only).

5-19. Although AFATDS, IFSAS, FDS, and LTACFIRE can perform all of the above functions, only tactical FD will be discussed in this segment.

5-20. AFATDS TFC program analyzes nominated targets, selects the method of attack, reviews available firing units and selects the optimal firing unit(s) for engagement. After analysis is completed and approved by the FDO (either through intervention or pre-established standards), the TFC program directs the delivery unit to attack the target.

5-21. The first step in providing for tactical FD involves establishing setup parameters in the computer. These parameters, entered prior to operations, consist of the tactical database and commander's criteria. Much of the general planning data is entered at maneuver brigade/DS FA battalion level or higher and disseminated downward, with some modification at each level. Unit locations, ammunition counts, and other data is input at lower levels and forwarded to higher HQ.

5-22. The tactical database consists of geometry, firing units, and ammunition and met information. The tactical database includes information from unit plans and orders such as the maneuver unit's zone, FSCMs, ammunition status, available firing units, firing unit locations, and atmospheric conditions.

5-23. The commander's criteria are simply the translation of the maneuver commander's concept for fires into system language. It includes information

such as attack methods, priority zones, target types, shells, priority of selecting firing units, and exclusion of any firing units or shells/fuzes. The computer uses commander's criteria to produce a fire order. Therefore, this information must be kept current and accurate.

5-24. AFATDS, IFSAS, FDS, and LTACFIRE contain information from the joint munition effects manuals (JMEMs) concerning amount and type of ammunition and the optimum number of units to fire for a particular target. The information enables the computer to select the best ammunition for a particular target. If the commander wants to reserve a certain ammunition for future use or to vary the JMEMs data, that guidance should be converted into commander's criteria and entered into the computer (FSE assisted by FDC). Once they have been established, the computer implements the criteria without delay in mission processing. Moreover, commander's criteria may be overridden manually anytime an urgent situation warrants it.

5-25. It is essential that the FDO, in concert with higher FA HQ and the brigade FSO (if applicable), continually assesses and adjusts the commander's criteria based on his guidance for the different phases of the operation. Changes in the tactical situation may make assumptions and guidance that were valid earlier inadequate or even dangerously wrong. If anticipated ammunition fails to arrive, firing units are lost, or if new threat units or equipment arrive in the supported unit's sector, the parameters in the computers must be adjusted. In a manual environment, this process is no less important, but it is much less easily overlooked. The FDO must aggressively seek new guidance from the FSCOORD (or battalion commander), brigade FSO, and S3 and adjust the commander's criteria to reflect current reality.

5-26. In the automated tactical FD process, AFATDS, IFSAS, FDS, and LTACFIRE automatically prepare a request for additional fires whenever the unit cannot provide the volume of fire specified by the commander's criteria. The unit sends the request to the force FA HQ and/or appropriate FSE.

TECHNICAL FIRE DIRECTION

5-27. Technical FD is the process of converting weapon and ammunition characteristics (muzzle velocities, propellant temperature, and projectile weight), weapon and target locations, and met information into firing data. Weapon sections use the results of this process for firing.

5-28. Technical FD is an increasingly decentralized process. Most technical fire computation is done in the battery or platoon FDC, and transmitted to the firing section, or it is done on the weapon system itself. As newer weapon systems are fielded, the latter method will predominate, and battery and platoon FDCs will increasingly assume a backup role.

5-29. The technical FD capability will be incorporated into future versions of AFATDS, but currently is done within BCS, FDS, or the onboard automation system of the newer individual weapon systems (Paladin, Crusader, MLRS, and high mobility artillery rocket system (HIMARS) at the time of this publishing).

5-30. Manual technical FD procedures are also maintained within cannon FDCs in case of catastrophic loss of automation capability.

MASSED FIRES

5-31. Massing all available fires enables the artillery to inflict maximum damage on the enemy with a minimum expenditure of ammunition. It reduces the vulnerability of the firing unit to the enemy's TA capabilities. Failure to mass fires may give the enemy time to react and seek protection. A clear understanding of the maneuver commander's guidance for FS and an accurate commander's criteria input into the AFATDS, IFSAS, FDS, or LTACFIRE are key to determine how much FA is enough. Every mission received must be evaluated, in the light of the commander's criteria, and sufficient massed fire should be employed to achieve effects required. If the FDO consults the JMEMs or accepts computer generated gunnery solutions, he will discover that most targets worth engaging should be engaged with volleys from two or more batteries or battalions. Suppression can be achieved, but the desired effects are achieved on few, if any, of them.

5-32. A FA battalion should maintain the maximum feasible degree of centralized control over the firing systems. There will very likely be many more calls for fire than assets available to fire them and still achieve the effects specified by the commander. The maneuver commander or his FSCOORD must be the one to decide which missions are critical to the success of the unit and which missions will not be executed or will be delayed. Commander's criteria are critical in managing the fires of the battalion. If good commander's criteria are developed and accurately entered into the automated systems, the computer can assume much of the burden of sorting the missions as they are received and assign them the appropriate priority.

5-33. One of the best techniques available to the FDO for massing fires is the use of TOT. Also, the FDO can effectively mass fire for effect on mobile targets through use of AMC in his fire order. With these techniques the element of surprise is not lost since the delivery of fires is controlled. Survivability of firing units is enhanced, because mass fire techniques require fewer rounds to achieve the desired effects and because massed fires temporarily saturate enemy TA devices. These two techniques for massing fires, when properly applied against appropriate targets, can result in maximized effects for the amount of ammunition used.

5-34. The key to massing fires effectively when more than one battery is to be fired for effect is the efficient use of voice to execute digital fire order(s). By using voice to execute the order(s), the battalion FDO can ensure that targets are engaged with the required number of firing units in a synchronized manner. Unit TSOPs should address the procedures for both digital and voice fire orders.

CONTINUITY OF OPERATIONS

5-35. AFATDS, IFSAS, FDS, and LTACFIRE equipped units have at least two or three central processing units (CPUs) in the battalion TOC. This redundancy has significantly reduced the need for complex and carefully orchestrated MSU operations. Once the systems are initialized and the data sharing paths established according to the operation, the computers will automatically, without human intervention, update all other systems with which a particular station is sharing information. A loss of any single

computer or group of computers in AFATDS, IFSAS, FDS, and LTACFIRE will not have a catastrophic impact. CONOPS functions are built into the software for rapid reaction to the loss of an operational element. The CPU at brigade FSE has the capability to serve as a backup system for the battalion if planned.

5-36. In addition to CONOPS, manual means will remain an effective backup to catastrophic loss of automated capability. The TOC should thoroughly plan and rehearse transfer to manual backup operations. A battalion FDO can establish manual operations more easily if the following tools are on hand:

- A current fire order standard. Issuing a correct fire order will greatly reduce confusion and errors.
- Written attack guidance. The JMEMs and graphical munition effectiveness tables (GMETs) are too cumbersome to be useful in a fluid tactical situation.
- A current ammunition count for the firing units. In cannon units, this includes projectiles, propellants, and fuzes by lot.
- A current situation map. As a minimum, the following information must be clearly and accurately displayed:
  - Maneuver boundaries.
  - Firing unit locations.
  - FSCMs.
  - The FLOT.
  - Observer locations.
- Range fans or the range-deflection protractor (Graphical Training Aid [GTA] 6-5-1) for checking ranges.

SECTION II – FA FIRE MISSIONS

5-37. This section provides general information and guidance concerning FA fire missions that may require special consideration by a FA battalion. Additional information about these missions, from the perspective of the observer, FDC, or FSE can be found in FM 6-30, FM 6-40, and FM 6-20-40.

IMPROVED CONVENTIONAL MUNITIONS (ICM)

5-38. ICM munitions are delivered by 105mm and 155mm howitzers and by MLRS (rockets and missiles). There are three types of ICM:

- **Antipersonnel (APICM)**. APICM is a cannon ICM most effective against unwarned, exposed personnel. When the submunitions hit the ground, the grenade is hurled upward 4 to 6 feet and then detonates.
- **Antipersonnel, Antimaterial (APAM)**. APAM is a missile ICM most effective against unwarned, exposed personnel and light material targets. It is a fragmentary grenade that explodes on impact.
- **Dual-purpose (DPICM).** DPICM, delivered by cannons and MLRS, is most effective against lightly armored vehicles and other materials. It is also effective against personnel. DPICM submunitions explode on impact, using both a shaped charge and fragmentation to achieve its effects.

CONSIDERATIONS

Dud Rates

5-39. Anytime ICM is fired, between one and three percent of the submunitions fail to detonate. About 50% of these duds will be armed. These dud rates may increase in adverse weather and terrain conditions. This hazard must be considered in development of the maneuver commander's guidances and in planning and firing missions. In AFATDS units, consideration of this hazard and the maneuver commander's guidance should be reflected in the AFATDS guidances and/or the FSCMs established by the FSE/FSCOORD. During periods of extensive ICM use, safety warnings about duds may need to be reissued within both military and civilian channels.

Weather and Terrain

5-40. Generally, ICM should not be fired into forests, mountainous areas (slope greater than 60%), or extremely rocky or uneven terrain. Deep snow or surface water, soft sand, and marshy terrain can also decrease the effectiveness of ICM and increase the dud rate. High winds may adversely affect the dispersal pattern, as well as the effectiveness and dud rate.

Height of Burst

5-41. Height of burst (HOB) is normally not a major factor for ICM, but it can sometimes vary and affect the dispersal pattern and dud rate. HOB can be adjusted for cannon ICM but not MLRS ICM. FM 6-30 and FM 6-40 provide observer and gunnery information on cannon ICM HOB adjustment. If frequent HOB problems occur (too low or too high), the FDO or S3 should

attempt to determine if the problems may be peculiar to a particular lot of ammunition, crew procedures, muzzle velocity variances, or other factors.

Danger Close

5-42. Caution should be used when firing ICM in danger close situations as an ICM round, rocket, or missile has a relatively large dispersal pattern and strong winds can affect the submunitions. A single round, rocket, or missile may be fired initially to verify targeting data and weather impact. Subsequent adjustments should be made with the entire firing unit. The observer should make corrections from the near edge of the effects pattern.

ILLUMINATION

5-43. Illuminating projectiles are available for 105mm and 155mm howitzers. They are used to illuminate a designated area, to aid in adjusting FA fires at night, for marking locations, or to orient friendly forces. They can also be used to mark targets (by air or ground burst) for air attack, or to "wash out" enemy passive night-sight systems when used at ground level. Depending on the caliber, an illumination shell can provide light for up to 2 minutes and can light an area up to 1,000 meters in diameter.

5-44. The amount of illumination ammunition required for a particular mission depends on the observer-target (OT) distance, the visibility, and the size, width, and depth of the area to be lit. The FDC and the observer must coordinate selection of the proper illumination pattern and controlled rate of fire to maximize illumination effectiveness with minimal ammunition expenditure.

5-45. Illumination is conducted by using one of the following techniques:

- The **one-gun** illumination pattern is used when effective illumination can be achieved by firing one round at a time.
- The **two-gun** illumination can be fired in range-spread or lateral-spread patterns. This is commonly used for aerial observers.
- The **four-gun** illumination pattern illuminates a large area. Four rounds burst at the same time in both lateral and range spread patterns.

5-46. Illumination missions may be fired as illumination only missions or as coordinated illumination missions. In the latter, firing of the illumination is coordinated with the firing of high explosive (HE), DPICM, or other attack munitions so that the observer can see the effectiveness and adjust fire as necessary.

CONSIDERATIONS

5-47. Except in unusual situations, the majority of a unit's illumination missions may be relatively close to the FLOT, involving shorter ranges and lower propellant charges. Using the lowest propellant charge possible also reduces damage to the round's parachute. The S3 should factor this into ammunition estimates and ensure the S4, BAO, and firing batteries understand the ammunition plan.

5-48. Identify EFATs involving illumination early in the MDMP. This facilitates the preparation of CCLs of ammunition and delivery of CCLs at

the proper time and place (e.g., illumination package Bravo, not-later-than (NLT) 1900 hrs, to battery A's supplementary position.) See Chapter 7 for additional discussion of CCLs.

5-49. Illumination missions may be lengthy missions, increasing the firing unit's vulnerability to enemy acquisition and attack. The S3 should consider directing platoons to fire illumination missions from supplementary positions as much as possible. If a high counterfire threat exists, the S3 should monitor lengthy missions and consider shifting the illumination to a backup unit or terminating the mission if it is low priority (with maneuver/higher FA concurrence). Wargaming during the MDMP can assist the S3 in identifying the best solution.

5-50. Coordinated illumination missions may involve several weapon systems and firing units, and without proper planning can tie up assets for relatively extended periods. During the MDMP, the S3 should evaluate EFATs requiring coordinated illumination missions to determine their potential impact on the overall fire plan, and the priorities of the fires potentially ongoing at that time.

5-51. Illumination can interfere with friendly night vision devices and expose friendly troops to enemy observation. S3s and FDOs must ensure that all firing restrictions are understood and properly disseminated and that all FSCMs and commander's guidances are correctly entered into both manual and automated fire control systems.

5-52. On a non-linear battlefield there may be more frequent safety/FSCM conflicts involving illumination as the canister continues on after the illumination package is ejected. Increased use of high angle fire may be necessary and selection of firing units may require more detailed planning.

SMOKE/WHITE PHOSPHOROUS (WP)

5-53. Smoke can significantly reduce the enemy's effectiveness both in the daytime and at night. Combined with other suppressive fires, it gives more opportunities for maneuver forces to deploy and aircraft to attack frontline targets. The effective delivery of smoke by the FA at the critical time and place helps the combined arms team accomplish its mission. (See Table 5-1 for smoke capabilities and effects.)

SMOKE MUNITIONS

5-54. Smoke munitions are available for both 105mm and 155mm cannon systems. There are three types of smoke projectiles used for FA delivered smoke. Each has different characteristics and capabilities that must be considered in their employment. The various smoke projectiles are often used in combination to more quickly and effectively deliver the required smoke coverage in the time required and for the conditions on the battlefield:

- **Hexachloroethane (HC).** HC projectiles, available for 105mm and 155mm howitzers, are used for screening, obscuration, spotting, and signaling. The projectile is not designed to cause casualties. The round expels smoke canisters that emit smoke for a period of 40 to 90 seconds.

- **Burster-type WP.** WP projectiles are available for 105mm and 155mm howitzers. They can be fired with point-detonating (PD) or MTSQ fuzes. Normally, shell WP is employed for its incendiary effect. It is also used for screening, spotting, and signaling purposes.
- **M825 WP.** The M825 WP projectile is a FA-delivered 155mm base-ejection projectile designed to produce a smoke screen on the ground for a duration of 5 to 15 minutes. The projectile contains 116 WP-saturated felt wedges that fall to the ground in an elliptical pattern. Each wedge then becomes a point or source of smoke. These burning wedges can also present a potential obstacle or hazard to friendly soldiers passing through the smoked area. FS planners must consider this when planning smoke operations.

EMPLOYMENT TECHNIQUES

5-55. Smoke is used for obscuration, screening, deception, and signaling.

- **Obscuring Smoke.** A smoke screen placed directly on or near the enemy with the primary purpose of suppressing observers and minimizing their vision.
  - To defeat flash ranging and restrict enemy counterfire programs.
  - To obscure enemy observation points (OPs) and reduce the accuracy of enemy observed fires.
  - To obscure enemy direct fire weapons, including wire-guided missiles, to reduce their effectiveness up to 90 percent.
  - To obscure enemy lasers to reduce their effectiveness.
  - To instill apprehension and increase enemy patrolling.
  - To slow enemy vehicles to blackout speeds.
  - To increase command and control problems by preventing effective visual signals and increasing radio traffic.
  - To defeat night observation devices and reduce the capability of most infrared (IR) devices.
  - To increase effectiveness of obstacles.
- **Screening Smoke.** A smoke curtain used on the battlefield between enemy observation points and friendly units to mask maneuvers.
  - **Deceptive Screens.** Smoke draws fire. Deceptive screens cause the enemy to disperse his fires and expend his ammunition.
  - **Flank Screens.** Smoke may be used to screen exposed flanks.
  - **Areas Forward of the Objective.** Smoke helps maneuver units consolidate on objectives unhindered by enemy ground observers.
  - **River-Crossing Operations.** Screening the primary crossing site denies the enemy information. Deceptive screens deceive the enemy as to the exact location of the main crossing.
  - **Obstacle Breaching.** Denies the enemy the ability to observe the breaching unit and to place accurate fires on that unit.
- **Deception Smoke.** A smoke curtain used to deceive and confuse the enemy as to the nature of friendly operations.
- **Signaling Smoke.** Smoke used to orient or signal friendly forces.

Table 5-1. FA Smoke Capabilities and Effects

DELIVERY SYSTEM	TYPE ROUND	NOMEN-CLATURE	FUZE	TIME TO BUILD EFFECTIVE SMOKE	AVERAGE BURNING TIME	AVERAGE OBSCURATION LENGTH PER ROUND (METERS) WIND DIRECTION	
						CROSS	HEAD OR TAIL
155mm Howitzer	WP	M110A2	M557 or M739	½ minute	1 to 1 ½ minutes	150	50
	Smoke	M116B1	M501A1	1 to 1 ½ minutes	4 minutes	350	75
	Improved Smoke	M825	M557 or M739	½ minutes	7 minutes	350	100-200
105mm Howitzer	WP	M60A1	M557 or M739	½ minute	1 to 1 ½ minutes	75	50
	Smoke	M84B1	M501A1	1 to 1 ½ minutes	3 minutes	250	50

DELIVERY TECHNIQUES

5-56. There are two types of delivery techniques used to employ FA smoke: immediate, and quick smoke.

5-57. **Immediate Smoke.** Immediate smoke is used to quickly obscure point or small area targets of 150 meters or less, for short durations. It is frequently used in a suppressive role against targets of opportunity, either by itself, or in conjunction with immediate suppression HE or ICM. The HE/ICM provides immediate suppression while the smoke extends the suppression over a wider area and a longer period. Immediate smoke is also used for planned, on-call fires against known or suspected enemy locations.

5-58. Immediate smoke missions normally are fire for effect (FFE) missions fired by one platoon, and are designed to provide obscuration for approximately 1-5 minutes. The initial volley may be fired with shell WP, fuze quick, or a mix of shell WP and shell HC in order to obtain rapid effects (within 30 seconds of impact). If additional volleys are fired, all howitzers should fire HC smoke. When firing the M825 smoke round, all howitzers should fire the M825 projectile for the initial and subsequent volleys. Unit TSOP should dictate the number of volleys and which howitzers will fire WP and which will fire HC smoke, if applicable. If immediate smoke is required for longer than 5 minutes, the requestor should notify the FDC during planning, or early in the fire mission. Because of potential target location error and changing environmental factors, the FA battalion S3 and FDO should always anticipate and plan for at least one correction, even for planned immediate smoke missions.

5-59. **Quick Smoke.** Quick smoke is used to quickly provide obscuration, screening, deception, or signaling smoke over a small to moderate area (100 to 600 meters) for approximately 5-15 minutes. (Environmental factors may extend quick smoke effects over a 1,500 meter area.) It may be fired as a planned target or target of opportunity. However, smoke screens larger than 250 meters in length should be preplanned due to ammunition constraints and the possible need to segment the target. Quick smoke missions usually

involve the fires of one or two firing batteries. A “standard” quick smoke mission is frequently used in TSOPs or in FASPs to facilitate planning and ammunition coordination. Deviations from the standard must then be identified early in the planning process or request for fire.

5-60. Quick smoke requests may be processed as adjust-fire or FFE missions. Accurate and effective FFE smoke is sometimes difficult to achieve due to surface winds and other environmental factors. The S3 and FDO should consider this during planning, and coordinate with the requestor to determine procedures for ineffective or inaccurate FFE smoke missions (switch to adjust fire procedures or repeat the FFE with an adjustment).

5-61. Obscuration, screening, or deception smoke over a relatively large area (600 – 1,500 meters) or for an extended period of time (greater than 15 minutes is usually fired as a planned mission as the ammunition, firing unit, and coordination requirements can be significant. To expedite emplacement of larger smoke screens, the FDC may direct multiple quick smoke missions. The S3, S4, and BAO must carefully evaluate EFATs involving large smoke missions to determine the impact on overall ammunition capability.

CONSIDERATIONS

Adjust Fire Missions

5-62. Adjust fire mission techniques vary dependent on the type of mission and ammunition. The following techniques apply only to standard adjust fire smoke missions as immediate smoke missions are FFE missions.

- **Shell Smoke (HC).** HE is used in adjustment until a 200-meter bracket is split. The observer then requests shell smoke. One smoke round is fired, and any necessary corrections (to include HOB) are made until the smoke is accurately located. Then FFE is requested. A subsequent adjustment may be necessary for maximum effectiveness.
- **Improved Smoke (M825).** The M825 does not need HOB adjustment. As a result, a 200-meter bracket is not split and FFE is started after a 200-meter bracket is achieved.
- **Burster-type WP.** HE projectiles are used during the full adjustment with WP fired when FFE is requested.

Available Means

5-63. For a FSO this entails analyzing all available sources, such as FA, mortars, and chemical unit smoke generating sections. FA battalion S3s must evaluate which firing unit(s) and what type of ammunition are best capable of supporting each FA smoke EFAT. MDMP wargaming and rehearsals must include careful evaluation of smoke EFATs and alternate smoke plans to ensure that the proper quantities and types of smoke ammunition are in the right places at the right times. In DS FA units, the S3 and FSO coordinate the integration of FA and mortar smoke capabilities. Mortars can back up a FA smoke EFAT, or the FA unit can back up the mortars. The FA S3 must also understand that based on the conditions and the size of the screen, two or more platoons or batteries may be required to effectively fire the mission.

Ammunition and Timing

5-64. Smoke EFATs must be carefully evaluated for ammunition and timing requirements. Basic loads usually include minimal smoke ammunition to support a few immediate or quick smoke missions. Projectile type, fuze, and, for 155mm, propellant requirements must be considered. Ammunition to support larger smoke requirements should be positioned near or delivered to the shooter relatively close to the time it will be needed. Backup plans must be considered, especially when smoke is a constrained resource. Timing is critical as firing too early or late can have adverse effects for the requesting unit, and can result in wasted ammunition.

5-65. FA battalion commanders and S3s must ensure that the supported maneuver commander and FSO or senior FA HQ thoroughly understand the FA battalion's smoke capabilities, and that planning for smoke does not exceed available resources. At times, the S3 may need to direct redistribution of smoke ammunitions to correct for imbalances or changing circumstances, such as loss due to hostile fire or accident. The S3 must quickly calculate the impact on smoke EFATs to determine the actions and notifications required.

Firing Unit Information Requirements

5-66. For the FDC to provide an effective smoke screen, the FDO needs to obtain additional information not normally provided for other missions. From the observer, the FDO needs the following:

- The center grid of the smoke screen.
- The length (size) of the smoke screen.
- The screen time (duration), in minutes.
- The maneuver target direction. The direction from the point at which the maneuver element will be most susceptible to enemy observation to the target.
- Wind direction in reference to the maneuver target line. The observer must let the FDC know if the wind is head, tail, left cross, or right cross in relation to the maneuver target line.

5-67. From the met station (or from currently available met data), the FDO will need to know the relative humidity for line 00 of the latest met message.

5-68. The FDO relies on a series of tables to determine the number of rounds to fire to establish and maintain the smoke screen for the desired duration requested. Until the necessary information is received, the FDO cannot properly calculate the number of rounds required. For planned missions, the FDO must analyze how potential changes in conditions may impact on firing requirements. If the number of aimpoints, rounds, or guns exceeds unit capabilities, the FDO will notify the S3 per unit TSOP.

Environmental Factors

5-69. Environmental factors impact significantly on the effectiveness of smoke. Atmospheric stability, wind direction, and wind speed are the major factors influencing the effectiveness of smoke. Whenever significant changes in weather conditions are expected, the S3 and FDO should determine the potential impact on smoke EFATs, such as higher ammunition requirements.

5-70. **Wind.** High winds can reduce the effectiveness of smoke. Wind speeds ranging from 4 to 14 knots are best for the production of smoke screens. The observer is the normal source of wind data for the target area.

5-71. **Temperature**. A rise in temperature may increase the rate of 70, causing smoke to dissipate more rapidly and lose effectiveness.

5-72. **Humidity and Precipitation.** High humidity and precipitation may enhance the effectiveness of smoke.

5-73. **Terrain.** Smoke seeks low spots. In built-up areas smoke may be effective for longer periods when trapped between buildings where strong winds are not prevalent. Smoke may cause fires in dry vegetation or in built-up areas. Smoke is normally not effective in deep mud, water, snow, or in mountains or other steeply sloped areas.

5-74. **Night.** Smoke is also effective at night. Atmospheric conditions at night may produce different effects on smoke than experienced during day.

SCATMINE

5-75. FA SCATMINE, which is currently limited to 155mm howitzers, gives the maneuver commander an all-weather capability to quickly emplace minefields. The two types of FA-delivered SCATMINE are:

- **Area denial artillery munitions (ADAM).** ADAM is an antipersonnel mine activated by deployed trip lines. ADAM are often used in conjunction with remote anti-armor mine system (RAAMS) to hinder the clearing of a RAAMS minefield by dismounted troops. ADAM may also be used alone against personnel and unarmored targets.
- **RAAMS.** RAAMS are used to create antiarmor or antivehicle obstacles. A percentage of the RAAMS have an antidisturbance device to hinder mine-clearing operations. RAMMS are most effective when used in conjunction with ADAM.

5-76. Both the ADAM and RAAMS have a self-destruct (SD) capability that destroys the mine if it has not been detonated within a certain period of time. Both the ADAM and RAAMS come in two SD versions – long (48 hours) and short (4 hours).

5-77. The corps commander has the authority to employ SCATMINE. He may delegate this authority for specific operations or limited periods as follows:

- Long duration down to maneuver brigade.
- Short duration down to maneuver battalion.

EMPLOYMENT

5-78. There are four basic uses of FA-delivered SCATMINE:

- To create an obstacle.
- To reinforce an existing obstacle.
- To deny use of an area.
- To interdict or disrupt enemy operations.

Create an Obstacle

5-79. FA-delivered SCATMINE enables the maneuver commander to quickly create an antipersonnel, antivehicle, antiarmor, or multi-purpose obstacle. ADAM can be fired by itself to create an obstacle effective against personnel and light vehicles. RAAMS can be used to create an antiarmor obstacle, however, ADAM are usually used in conjunction with RAAMS to prevent easy clearing of the obstacle. A combination ADAM/RAAMS minefield creates a multi-purpose obstacle that obstructs personnel, vehicles, and equipment.

5-80. Like any obstacle, SCATMINE is best used at a choke point covered by effective indirect and direct fire. The principles of obstacle coverage apply even more strongly to SCATMINE because:

- The mines are surface-laid and visible.
- FA-delivered minefield tend to be small and of low density (because of ammunition constraints).
- They are easily bypassed and/or breached. An undisturbed enemy can work through a SCATMINE minefield relatively quickly.

Reinforce an Obstacle

5-81. ADAM and RAAMS can be used in combination or individually to reinforce other antipersonnel, antivehicle, and antiarmor obstacles emplaced by engineers or maneuver forces. ADAM can strengthen antipersonnel obstacles such as concertina wire, or disrupt beaching of antiarmor obstacles like abatis and trenches. This is especially useful when time or unit resources limit the size or effectiveness of an engineer or maneuver force obstacle. The SCATMINE may be fired in soon after the primary obstacle has been completed, or it may be scheduled as a planned mission to be fired at a specific time or on-call based on an event or other triggering factor. SCATMINE can also refresh or strengthen obstacles that have been weakened, breached, or are otherwise ineffective in obstructing the enemy.

Area Denial

5-82. SCATMINE can be emplaced on key terrain or facilities to deny the enemy use of the area. This may be critical high ground, a potential landing area, or other location that can not be effectively controlled by other means. As with obstacles, area denial minefields have little or only short-term effectiveness unless covered by direct or indirect fires.

Interdiction/Disruption

5-83. SCATMINE can be used by itself, or with other munitions (from any FS system) to interdict movement and disrupt enemy operations. It can be effective in the following situations:

- River crossing sites, airmobile landing zones, or beachheads.
- Large multi-column convoys in restricted terrain.
- Concentrated vehicle and/or troop formations (at critical times or locations – such as dismounting mechanized infantry).
- Counterfire – artillery firing locations.

- SEAD – EAD sites (most effective when synchronized with air operations).
- Logistics facilities – ammunition and POL sites, railyards, tactical air or helicopter landing zones.

5-84. For interdiction and disruption, SCATMINE is most effective when used in conjunction with other munitions. The other munitions cause damage, injuries, fires, disorientation, and fear. This creates hasty movement, forces armored elements to button up, and hinders clearing operations.

5-85. For counterfire and SEAD, fire DPICM first, then smoke (optional), followed by SCATMINE. The smoke will obstruct vision and may initially force an increased MOPP posture further degrading vision. This makes it difficult for the enemy to see and clear the SCATMINE, which disrupts the enemy's ability to reorganize, reconstitute, and move. The SCATMINE causes additional injury and damage and continues to interfere with operations after the firing has ended. SCATMINE by itself may not be very effective for counterfire or SEAD as the enemy may be able to remain in place and continue firing with little disruption, especially in SP units.

5-86. Because interdiction/disruption minefields are often not observed or covered with direct fire, they are more effective when synchronized as part of a larger operation. As an example, used for SEAD, SCATMINE would be most effective immediately prior to or during an air operation in the area. SCATMINE at an enemy river crossing site would be most effective just as the enemy was trying to establish the site or use it for a major operation.

SCATMINE MISSIONS

5-87. FA SCATMINE minefields consist of two general types:

- **Planned minefields.** A planned target, on the target list. Planned minefields are normally less than 600 meters wide, but may be as large as necessary to achieve the effects desired. They also:
  - Are emplaced as scheduled or on-call targets.
  - Require extensive coordination between maneuver, engineer, and FS/FA personnel.
  - Require extensive logistical support.
  - Use primarily long SD mines.
  - Allow safety zones to be computed before firing.
- **Target of opportunity minefields.** Are emplaced as a result of an immediate call for fire request on an unplanned target. They:
  - Are a standard minefield based on unit TSOP (For example - 400x400 meters, high angle, medium density, two aimpoints).
  - Consist of a combination of 24 RAAMS and 6 ADAM projectiles (these numbers may change depending on the threat and the commander's guidance).
  - Use only short SD mines (carried as part of the basic load).
  - The safety zone, based on a single aimpoint, is computed immediately after the minefield is fired.

SCATMINE CONSIDERATIONS

5-88. Battery minefield angle (BMA), range, and target size all impact the fire order requirements for effective SCATMINE delivery. Because SCATMINE missions can be lengthy missions to fire (10-30 minutes), the S3 must consider the time the unit will be unavailable to fire other missions and the increased vulnerability of the unit to enemy acquisition and counterfire. The S3 should consider force protection measures, such as using additional howitzers to decrease the time, firing the mission from an alternate (possibly hardened) position, or directing a survival move after mission completion.

Safety Considerations

5-89. Firing SCATMINE close to friendly troops is potentially hazardous, as SCATMINE is an area weapon that can be affected by high winds. If the center of the minefield is less than 700 meters from the nearest friendly position, the unit should follow danger close procedures as the edges of the minefield could easily fall within normal danger close distance (600 meters). Planned danger close SCATMINE minefields should be adjusted in with HE or ICM whenever possible.

5-90. A safety zone should be computed for each SCATMINE minefield. The controlling FSE is generally responsible for determining safety zones. However, the actual data may be computed by the firing FA FDC or by the FSE. See FM 6-40 for specific techniques.

Recording and Reporting the Minefield

5-91. The SCATMINE delivery unit's FDC is responsible for initiating the scatterable minefield report, first by radio and later by hard copy. The FDC submits the report through the FSE to the engineer, generally with an information copy through FA channels. See FM 6-40 for more information.

COPPERHEAD

5-92. Copperhead is a 155mm cannon-launched guided projectile with a shaped warhead and a laser seeker. When fired at moving or stationary hard targets, Copperhead homes in on laser energy reflected from the target during the final 20 seconds (approximately) of its trajectory. The ground laser operator may use a G/VLLD, a laser target designator (LTD), or modular universal laser equipment (MULE). Airborne systems with lasers include the AH-64, OH-58D, and unmanned aerial vehicles.

CONSIDERATIONS

5-93. Much of the responsibility for planning and executing Copperhead missions rests with the FSEs and observers. However, the FA battalion S3 and battalion and battery FDOs must thoroughly understand the process in order to better support the mission, to anticipate changes, and to identify effective workarounds or troubleshooting techniques when problems arise.

Planning

5-94. Copperhead targets can be engaged as planned targets or targets of opportunity, however, planned targets are preferred. Planned targets fall into two categories: priority and on-call.

- For priority targets, data are precomputed and set on the guns, and the Copperhead round is laid in its loading tray. Unless otherwise specified on the target list, two Copperhead rounds are prepared in advance for each Copperhead priority target.
- On-call targets are processed the same as priority targets, except the guns are not laid on firing data until after receipt of the mission. On-call target procedures for Copperhead are the same as those for conventional on-call missions.

5-95. **NOTE**: FDC personnel must ensure that at least two howitzers and two Copperhead rounds are prepared for any mission. This action increases firing unit responsiveness if a round or howitzer malfunctions. The criteria in Table 5-2 are used for all Copperhead missions.

Table 5-2. Copperhead Criteria

TARGET STRENGTH (Observer Entry)	ROUNDS SPECIFIED (FDC ENTRY)	NUMBER OF HOWITZERS
1[1]	2	2
2	2	2
3	3	2
4	4	2
5	5	2
6[2]	6	2

[1] If a single target element is important enough to warrant firing Copperhead, the observer should request 2 rounds and "By round, AMC." This reduces response time in case of a target miss and prevents wasting the second round if the first succeeds in destroying the target. An optimum of one round per target is used as a planning factor.

[2] No more than six rounds will be prepared for any given mission.

Control Procedures

5-96. If the number of rounds to be fired is not specified in the call for fire, the FDC will fire the number of rounds specified for that target on the Copperhead target list. If the number of rounds is not specified on the target list, the FDC will fire one round at the target and direct the howitzer(s) to prepare, but DO NOT LOAD, a second round. The message-to-observer (MTO) will reflect 1 round.

5-97. When the observer requests AMC, the Copperhead rounds will be fired at intervals of at least 30 seconds when the observer gives the initial command to fire. When BY ROUND, AMC is requested, the observer will control the firing of each Copperhead round. The observer must understand this and act accordingly so as not to waste rounds.

Pulse Repetition Frequency (PRF) Code Set

5-98. The three-digit PRF code set on the Copperhead round must match the PRF code set on the observer's designator. The FDC should have a list of all

observer PRF codes by call sign, from which it selects the proper PRF code for the observer lasing the mission. The PRF code is then sent to the howitzers in the fire commands and is placed on the Copperhead round. The observer verifies the PRF code announced in the MTO. Early identification and coordination of PRF codes is a key FDO/FSO responsibility.

DANGER CLOSE

5-99. The term "danger close" is used when friendly troops are within a prescribed distance of the intended impact of munitions, specifically 600 meters for cannon FA and 2,000 meters for MLRS. This is simply a warning and not a restriction to both the maneuver commander and the FDC to take proper precautions. Risk-estimate distances are used in danger close situations to determine whether or not to fire. Risk-estimate distances are defined as the distance in meters from the intended center of impact at which a specific degree of risk and vulnerability will not be exceeded. Risk estimate distances are for combat use and are not minimum safe distances for peacetime training.

5-100. The risk-estimate casualty criterion is the 5-minute assault criterion for a prone soldier in winter clothing and helmet. The probability of incapacitation (PI) means that a soldier is physically unable to function in an assault within a 5-minute period after an attack. The 0.1 percent PI value can be interpreted as being less than or equal to one chance in a thousand. The ground commander must accept risk when targets are inside 0.1 percent PI.

Table 5-3. Risk-Estimate Distances

Item/System	Description	Risk Estimate Distances (Meters)					
		10% PI			0.1% PI		
		1/3	2/3	Max Rg	1/3	2/3	Max Rg
M102/M119	105mm Howitzer	85	85	90	175	200	275
M109/M198	155mm Howitzer	100	100	125	200	280	450
M109/M198	155mm DPICM	150	180	200	280	300	475
M270A1	MLRS	2 km	2 km	2 km	2 km	2 km	2 km
M270A1	ATACMS	5 km	5 km	5 km	5 km	5 km	5 km

CONSIDERATIONS

5-101. Normally the observer will include danger close notification in his call for fire. However, untrained, or non-FA observers may not provide this alert. In the latter case, an FSE or FDC should notice the danger close situation during mission checks. AFATDS currently does not provide automatic danger close alerts, but may have this capability in future versions. In relatively static situations, various automated FSCMs, such as RFAs, can sometimes be used to provide increased warning of danger close situations.

5-102. In danger close missions the situation, type of ammunition being fired, the number of rounds, method of fire, observer-target-gun (OTG) angle, weather, and terrain conditions all must be considered to ensure safe firing. HC smoke or illumination rounds do not present as much danger as HE or ICM rounds. Likewise, a battery or battalion fire-for-effect mission carries more risk than an adjust fire mission. Leaders should closely monitor danger

close missions to ensure extra caution is applied, any required TSOP guidelines are followed, and commander's risk guidances are not violated.

5-103. FSOs and FDOs should quickly assess the experience of the observers and firing elements whenever possible. FSOs, FIST chiefs, and battery commanders can often answer these queries. In the case of an inexperienced observer, the FDC may need to guide the observer's decisions and give recommendations. If a firing section is inexperienced or undermanned, the platoon leader or sergeant may want to directly observe the firing.

5-104. If the FSE/FIST and FDC can anticipate the danger close situation (such as a FPF), they should discuss the possibility of adjusting in the fires before they are required. If the weather changes significantly over time, the FDC will need to update firing data for a new met and the FDC may coordinate a check round with the observer to verify accuracies.

5-105. Weather and terrain can impact certain munitions such as ICM, smoke, illumination, and variable time (VT) fuzes. High winds can blow ICM bomblets and illumination rounds off course. Some munitions such as smoke, illumination, and WP present a potential fire hazard that may be critical in danger close situations. Dry, grassy terrain, spilled fuel, damaged vehicles loaded with ammunition, wooden structures all present potential hazards.

5-106. Mountainous and urban terrain complicate danger close missions as steep slopes make observer adjustment more difficult to estimate, and crests or buildings can interfere with firing, stopping rounds or causing VT fuzes to function early. High angle fire can alleviate problems with crests or buildings, but may have greater dispersion (probable error). Rocky terrain and hard surfaces present increased risk of ricochets, especially with flat trajectories.

5-107. The OTG angle is a factor because range dispersion of artillery fires is generally greater than lateral dispersion. Consequently there is less risk when the firing trajectory runs parallel to the forward edge of the friendly troops than when it is perpendicular to them.

5-108. Whenever possible, the most accurate weapon system and shell/fuze/charge combination should be used for danger close situations. Ground burst smoke or illumination can be used as marker to verify expected impact, observer, and target locations.

SECTION III – COUNTERFIRE

5-109. The counterfire battle is not a separate battle, but one aspect of the overall combined arms fight. As such it must be properly integrated and synchronized with all elements of the maneuver commander's battle plan. Successful counterfire operations will complement all aspects of the combined arms battle.

5-110. Effective counterfire includes the destruction or neutralization of enemy weapons (to include EW weapons such as jammers), counterfire TA systems (such as radars and EW systems), supporting C2 and communications, transportation, and logistics sites. However, the critical aspect in counterfire operations is information management, which involves two key areas: intelligence/TA and information processing. Friendly and enemy intelligence and TA assets compete to find the various parts of each others indirect fire system, analyze the information, decide the most effective method to attack, and disseminate orders to shooters, jammers and other attack assets. Accuracy (of information and fires), speed, and effectiveness all combine to determine the outcome of the counterfire battle. FM 6-121, *Field Artillery Target Acquisition*, provides thorough tactics, techniques, and procedures for FA TA assets.

RESPONSIBILITIES

5-111. The maneuver commander at brigade and higher levels has overall responsibility for the planning and conduct of counterfire operations as part of the overall combined arms battle plan. In a FA battalion the key counterfire personnel are the FA battalion commander, S2, S3, targeting officer, and where applicable the brigade FSO, radar section leader, and LNO (from a reinforcing battalion, if available). The maneuver commander receives input and recommendations from his FSCOORD, FSO, maneuver S3 and S2, other staff officers involved in counterfire operations. He issues decisions and guidance as necessary to direct counterfire efforts, to ensure effective coordination occurs, and to ensure that counterfire is synchronized with all other battlefield operations. While DS FA battalions receive this guidance through direct involvement with the supported maneuver units, R, GS, and GSR units frequently receive this counterfire guidance through the supported or higher FA HQ.

5-112. The FA battalion commander has overall responsibility for the FA battalion's execution of counterfire responsibilities. In a DS battalion, the FA battalion commander, as the FSCOORD, advises the maneuver commander on the integration of counterfire into combined arms operations, the priority of counterfire within the overall operation, and basic counterfire priorities.

5-113. A FA battalion's counterfire responsibilities will vary dependent on the echelon, tactical mission, and guidance from the maneuver and senior FA commanders. A DS FA battalion may have full responsibility for planning and executing a counterfire plan in support of a maneuver force, while a GS FA battalion's responsibilities may be limited to planning and executing its participation in a larger counterfire plan developed by a FA brigade, DIVARTY, or Corps Arty. Acquired counterfire targets may be fired by the

battalion or forwarded through FA or FS channels for attack by other FA or even non-FA assets.

5-114. A major part of counterfire is a FA battalion's counterbattery efforts. The S3, based on the commander's guidance, considers counterbattery force protection measures in all phases of operations, from placement selection, to movement, and firing. He directs measures to decrease the battalion's vulnerability to detection and minimize exposure to enemy fires. He and the S2 attempt to locate and destroy enemy mortars and artillery that pose the greatest threat before they can attack. Reactive counterbattery drills are executed to quickly counter enemy artillery and mortars before they can inflict significant damage on the battalion.

DS/R BATTALIONS

5-115. A DS battalion supporting ground forces usually manages the counterfire battle within the maneuver zone of responsibility. Much or most of this responsibility may be given to a reinforcing unit. At this echelon, the DS battalion commander, as the FSCOORD, is responsible for directing the planning and execution of counterfire operations for the supported maneuver force. This includes:

- Supporting the maneuver commander's force protection priorities, normally stated in terms of assets, functions, and/or positions that are critical to the unit's mission, and when they are critical.
- Development, dissemination, and management of intelligence and order of battle information on the enemy's indirect fire system. This concerns all systems in the maneuver unit's zone of responsibility, as well as any outside the zone that can impact the maneuver unit's mission. This includes:
  - Indirect fire weapon systems – mortars, cannons, rocket, and missile launchers.
  - TA assets – observers, radars, sound/flash systems, and electronic intelligence.
  - C2 elements relevant to counterfire operations.
  - Enemy indirect fire tactics.
  - Enemy counterfire tactics – to include use of lethal and nonlethal ground and air forces against friendly FA.
- Advising the maneuver commander in establishment of attack guidance for counterfire targets.
- Coordination of the maneuver unit's counterfire operations with higher echelon counterfire operations.
- Integration of counterfire into the maneuver plan in a complementary manner that helps enable specific maneuver operations.
- Achieving indirect fire superiority within the maneuver zone.

GS/GSR BATTALIONS

5-116. GS and GSR units are usually not responsible for development of the counterfire battle plan as the force FA HQ or an FA brigade HQ normally will plan counterfire. Much of the counterfire intelligence and order of battle

information will be collected, analyzed, and disseminated from these higher echelons. However, radars and other TA or intelligence assets may be attached to, or reporting to GS/GSR units. The GS/GSR FA battalion commander must understand his unit's responsibilities as a role player in the larger counterfire fight, and ensure efficient execution of assigned counterfire tasks. At division level, a GS/GSR battalion may be given significant responsibilities for actual execution of the counterfire fight.

COUNTERFIRE CONSIDERATIONS

TYPES OF COUNTERFIRE

5-117. Counterfire can be proactive or reactive. Corps is generally responsible for proactive, deep counterfire planning and operations. They establish overall priorities and allocate resources that direct or influence lower level counterfire operations. However, the basic principles of proactive and reactive counterfire are applicable even at the DS battalion.

Proactive Counterfire

5-118. Proactive counterfire involves the aggressive use of all available intelligence, TA, and attack assets to quickly find and destroy as much of the enemy's indirect fire assets as possible; preferably before they have a chance to fire or to effect the outcome of the battle.

5-119. Counterfire PIR are identified and prioritized by the maneuver commander based on advice from his staff, FSCOORD, and FSO. Intelligence and TA assets are then tasked to acquire the needed information. Attack assets are aligned against identified and anticipated targets, and general counterfire missions. Intelligence, TA, and attack requirements beyond the unit's capabilities are forwarded to higher HQ for support.

5-120. The force FA HQ (possibly a DS battalion) works closely with the supported maneuver unit to develop and coordinate procedures to receive, analyze, process, and disseminate the acquired information. This involves the establishment of commander's guidances and priorities and of communications channels. Quickfire channels may be used to facilitate the attack of critical counterfire targets or to weight the counterfire battle in a specific area of the battlefield or a particular phase of a battle. Targets may be attacked immediately or developed into preparations and counterfire programs synchronized with maneuver and air operations to gain a synergistic battlefield effect.

5-121. Proactive counterfire involves the aggressive use of non-FA attack systems to include:

- Aircraft - fixed and rotary-wing. Planned missions may be increased and air assets may be encouraged to aggressively seek indirect fire targets of opportunity whenever possible.
- Ground force operations. This may involve quick, moderately deep penetrations oriented on destroying or encircling specific enemy artillery forces, or small, focused, special forces type attacks.

- EW attacks. Proactive jamming and other EW attacks are frequently best used in conjunction with other attack methods, especially major combined arms team attacks as they do not have an attrition effect comparable to other attack methods.
- The use of free fire areas (FFAs), especially where counterfire planners have found, or expect to find, concentrations of enemy indirect fire systems.

5-122. Proactive counterfire frequently involves the dedication of additional indirect fire assets, such as mortars, FA, and naval gunfire to the counterfire effort. This support may be focused during a specified time frame to better allow the synchronization of all assets supporting the counterfire battle. Frequently one or more FA battalions may be given a reinforcing mission with the specific purpose of concentrating on proactive counterfire in a designated maneuver brigade zone. A DS battalion may even briefly receive reinforcement, or priority of fires from an entire FA brigade in order to proactively prosecute counterfire long enough to influence a battle.

5-123. Major, proactive counterfire efforts are especially effective in providing force protection to the combined arms force, enabling major maneuver operations, and in reducing the enemy's ability and will to fight. Because proactive counterfire can be resource intensive, it may be planned for a specific time during a battle. This may be immediately preceding a friendly offensive operation or at a culminating point where a friendly or enemy attack begins to stall. Proactive counterfire can also be used during lulls in the ground fight, when more assets may be available, to reduce enemy FA capability prior to the next major maneuver operation.

Reactive Counterfire

5-124. Reactive counterfire focuses on fires in response to enemy artillery or EW weapons that have begun firing, jamming, or otherwise impacting the overall battle or the counterfire fight. Reactive counterfire is not a passive activity. It requires careful analysis of anticipated and potential reactive counterfire requirements, and the planning and coordination to ensure that effective reactive counterfires are immediately available when and where they are needed.

5-125. In the defense, planning of reactive counterfire programs and counterpreparations is especially critical when an enemy attack is imminent. These programs are fired immediately, while FA and maneuver S2s attempt to identify the main effort and to determine how significantly the enemy has weighted his indirect fire assets in that area. Effective reactive counterfire involves the rapid reallocation, movement, and focus of counterfire assets to quickly counter and eliminate a possible enemy indirect fire advantage.

5-126. During offensive operations, reactive counterfire is essential in protecting attacking forces and in blunting the enemy's ability to use indirect fires to defeat the friendly force attack. Units may establish radar CFZs to provide increased force protection to key attack elements and to allow rapid reactive counterfire to be placed on any enemy indirect fire elements that threaten a protected friendly force. Planners may position CFFZs on locations where enemy FA is suspected but accurate targeting data has not been

refined. Quickfire channels and preclearance of fires can be used in these circumstances to facilitate rapid reactive counterfire (and FSCMs such as FFAs). Speed is especially important in reactive counterfire as the enemy artillery or mortars must be destroyed or neutralized before they can do significant damage.

5-127. FA fires are a primary source of reactive counterfire due to the quick reaction time required. FA units may need to quickly move to forward supplementary positions specifically intended for use in attacking deep, reactive counterfire targets. These are often brief, intensive, shoot-and-scoot operations. If extended stays in these positions are necessary, hardening of the PAs should be planned.

AMMUNITION

5-128. Counterfire operations can require significant amounts of ammunition, especially DPICM and extended range munitions. Accurate IPB templating, and the use of counterfire CCLs of ammunition and standard counterfire fire orders can help the S3 and BAO can more accurately anticipate both expenditures and resupply requirements.

5-129. At maneuver brigade level, effective allocation of counterfire tasks is essential to efficient ammunition distribution when a reinforcing unit is involved. If the reinforcing unit is an MLRS unit (or a 155mm unit supporting a 105mm battalion), assigning the reinforcing unit a majority of the counterfire responsibility may allow the DS unit to carry additional ammunition to support the close battle. If both the DS and R unit are a similar caliber, the S3 has more flexibility in directing fire missions, however primary counterfire shooters should be identified to facilitate planning, ammunition management, and positioning. To range some counterfire targets, the designated firing units may need to be well forward with increased amounts of extended range ammunition.

5-130. MLRS is an especially effective counterfire weapon. However, ammunition reload times must be considered. During extensive counterfire operations, the S3, S4, and BAO must be extremely proactive in pushing CCLs forward to the launchers to keep reload times to a minimum.

RADAR MANAGEMENT

5-131. FA counterfire operations frequently involve the attachment or support of one or more counterfire radars. The following paragraphs provide information concerning radar management. FM 6-121 contains detailed information on radar operations and TA.

5-132. The S3, S2, and the radar section leader, in coordination with higher FA headquarters and FSEs of supported maneuver units, must work closely to ensure organic, attached, or assigned radars are effectively managed. In determining the positioning, movement, orientation, and cueing of radars the S3 and S2 must consider:

- Radar capabilities.
- Security.
- Communications.

- Position Considerations.
- Survey.
- Mission.

RADAR POSITIONING

5-133. The primary consideration in selecting a radar position is mission accomplishment. The secondary consideration is survivability. Radar position selection starts when the S2 and/or targeting officer conduct terrain analysis. They use the MCOO, Terrabase, Firefinder positioning analysis system, and the situational template developed and refined by the intelligence section. They conduct map reconnaissance and select several potential positions. After detailed analysis of these, they recommend primary, alternate and supplemental positions to the S3, who accepts, rejects, or modifies the positions. The staff should consider the following when positioning radars:

- Does the position support the commander's intent?
- Where are the enemy's indirect fire systems, or where will they most likely be?
- Where will the enemy focus his indirect fires?
- Can the radar acquire targets throughout the zone of the supported force?
- What are the EW, ground, and air threats to the radar?
- Does the position effectively maximize the radar's range capabilities while simultaneously minimizing the risk of enemy TA?
- Does the position offer a screening crest?
- What is the track volume and aspect angle?
- When applicable, are AN/TPQ-36 and AN/TPQ-37 radars positioned to complement each other?
- Does the position offer good communications with the FA battalion?
- Does the position consider future operations and movement?
- Where are the radar alternate positions? Supplemental positions?
- Are there positions to move forward or fall back to?
- Where are the positions of other friendly units?
- Is the radar on a high-speed avenue of approach that could potentially make it vulnerable to rapid advancement by the enemy?
- Where are possible sites for enemy chemical strikes or air assaults?
- Is the route clear of enemy, chemicals, and mines?
- What is the friendly scheme of maneuver?

5-134 When possible, the radar section leader or section chief should reconnoiter the sites and provide input to the S3. The S3 coordinates the radar's position(s) with the maneuver unit S3 via the FSE.

RADAR ZONE MANAGEMENT

5-135. Radar zone management involves the use of both sectors of search and various types of zones. The S3, S2, targeting officer, radar section leader, and the brigade, division, or corps FSE work together to ensure that sectors and zones adequately support the overall plan. This involves close coordination

with their counterparts in R (or reinforced), GSR, and GS FA units and higher/lateral FA HQ.

Sectors Of Search

5-136. Sectors of search are areas on the battlefield where radars focus their TA capabilities. The S3 and S2/targeting officer determine sectors of search during the decide function of the targeting process, on the basis of a thorough IPB. They also make decisions concerning what targets should be acquired and attacked, where and when targets are likely to be found, and who can locate them. Doctrinal employment considerations, in conjunction with templates and intelligence produced in the IPB process, dictate the areas in which the radar should focus its searches. The location of friendly boundaries and FS coordinating measures may also affect the assignment of sectors of search. The area given to a specific radar as a sector of search may be affected by the positioning of a common sensor boundary (CSB).

Zones

5-137. Zones are a means of prioritizing radar sectors of search into areas of greater and lesser importance. Zones allow radar managers to orient on the maneuver commander's battlefield priorities. Four types of zones can be entered into a Firefinder radar computer. These are CFZs, CFFZs, artillery target intelligence zones (ATIZs), and censor zones (CZs). The firing unit locations the radar has developed as targets are displayed for transmission in the order of the priority of the zones in which targets are located. The zone priorities for location identification, from highest to lowest, are:

- Locations of weapons firing into a CFZ.
- Weapons firing from a CFFZ.
- Weapons firing from an ATIZ.

5-138. All other weapon firing locations are displayed after locations associated with these zones. All locations other than those associated with a CFZ or CFFZ are formatted by the radar computer as target reports in ATI;CDR format. If the radar has no zones loaded, then all locations are transmitted in the ATI;CDR format. The radar computer will not develop weapon locations that are within a censor zone. See FM 6-121 for additional information on radar zones.

RADAR MOVEMENT

5-139. The S2 or targeting officer moves the radar based on METT-TC and the radar's accumulated cueing times. Moving the radar at a critical time in the battle may cause the supported unit to take heavy losses. The radar should move when the enemy's FA is silenced or moving. The best way to anticipate the enemy FA movement is to force it to move with counterfire. When the radar moves, coverage must be coordinated with the force FA HQ.

5-140. During the wargaming process, the battalion S2 and S3 decide when they want to try to force the enemy's FA to move and when accumulated cueing time can cause radar detection. They include these events as decision points on the DST.

RADAR CUEING

5-141. The longer a radar radiates, the more susceptible it is to enemy acquisition. Cueing allows the radar to transmit intermittently, for relatively short periods in order to reduce vulnerability. Cueing should be event driven. The critical factor when planning radar cueing is responsiveness. It should allow for the radar to locate the enemy positions during initial volleys of fire, preferably the first rounds.

5-142. The S2 and/or targeting officer has basically two techniques for cueing: situational (proactive) and demand (reactive). While situational cueing in generally preferred, the S2 can use these separately or in combination.

5-143. **Situational cueing** can potentially be the most responsive. This method ties cueing to events and/or triggers that are determined during the IPB and planning processes. For example, during offensive operations an event or trigger may be a breaching or air assault operation. In a defensive or offensive operation, cueing may be tied to suspected enemy phases of fire depicted on the DST. Situational cueing also focuses the radar on the commander's intent and what is critical.

5-144. **Demand cueing** is the activation of a radar once the enemy has begun firing. For demand cueing to be effective cueing agents must be designated and a responsive communications system between the agents and radar established. Possible cueing agents may include COLTs, FISTs, OH-58Ds, scouts, FSOs, intelligence and electronic warfare (IEW) systems, or the S2.

5-145. The S2 and/or targeting officer in the controlling FA TOC will establish cueing guidance to include authorized agents, communications links and conditions under which the radar may be cued. The information will be published in the TA tab to the FA support plan. Specific cueing guidance must be established to fully exploit the radar's capabilities and still minimize or eliminate unnecessary radiation that may result in the radar being located by ELINT. An important part of cueing is the cueing schedule. The cueing schedule informs the radar on how long to radiate. FM 6-121 states: "Maximum continuous transmission time for Firefinder radars should never exceed 2 minutes when an EW threat exists." Some cueing guidelines used effectively by units at the National Training Center were as follows:

- If the ELINT threat is high, the radar should cue no more the 15 to 30 seconds "on" and 15 to 60 second "off," and
- During the enemy's most intense fires, the cueing time should increase to 30 to 45 second "on" and 5 to 15 seconds "off".

WARGAMING

5-146. The S2 and targeting officer plan, coordinate, and synchronize the counterfire fight during the wargaming process. They recommend CFFZs, decision points, and triggers for cueing and moving radars and for changing zones. They coordinate with the FSEs for supported force CFZs. The following should be considered when planning counterfire during wargaming:

- What is the counterfire unit? (Unit designated by the S3 on the FDO's recommendation, considering range, munition, and position.)
- What will happen if multiple acquisitions occur simultaneously?

- What is the standard fire order? (The FDO recommends a standard fire order for S3's approval, ensuring it meets the commander's guidance.)
- What are the decision points on when to move the radar? (Decision points are based on the phases of fire or accumulated cue time.)
- What are the decision points to change the radar zones? (The decision points are based on the phases of fire or maneuver unit's advance.)
- What are the decision points on when to start cueing?
- Are radar zones planned throughout the depth and width of the battlefield, anticipating enemy and friendly movement?
- When does the S3 want the enemy's artillery to move?
- Does the plan account for overwhelming success? For catastrophic failure?
- How many tubes must be destroyed to meet the commander's intent?
- Can the CFFZs be pre-cleared with the FSOs? Consider use of FSCMs such as FFAs and RFAs.)
- What are the decision points on massing the battalion on the enemy's artillery?
- What is the cueing schedule during the difference phases of fire?
- What is the methodology to track the destruction/force ratio of the enemy artillery?

5-147. There are several critical decision points in the wargaming process. One of the most important involves forcing the enemy's forward artillery to move, which allows the radar and the counterfire unit to move (without jeopardizing force protection). This may be accomplished by suppressive, neutralization or destruction fires. Another critical decision arises when target acquisitions occur simultaneously: the counterfire unit can become overwhelmed. Table 5-4 lists the options available when the radar receives multiple acquisitions.

Table 5-4. Multiple Target Acquisitions

Type Targets	Direct Support Unit With A Reinforcing Battalion	Direct Support Unit Without a Reinforcing Battalion
Multiple Targets in Range	• R Bn engages one target and passes other target to the DS Bn. • R Bn engages both targets simultaneously. • R Bn engages both targets sequentially.	• DS Bn engages both targets simultaneously. • DS Bn engages both targets sequentially. • DS Bn engages one target and passes the other target to force FA HQ/FSE for attack with other assets.
Multiple Targets in Range, but the DS Bn is Involved in Missions with a Higher Priority	• R Bn engages one target and passes the other target to the force FA HQ/FSE for attack with other assets.	• DS Bn passes the targets to the force FA HQ/FSE for attack with other assets.
Multiple Targets - Some Out of Range	• R Bn and DS Bn engage the target within range and pass the other target to force FA HQ/FSE for attack with other assets.	• DS Bn engages the target within range and passes the other target to the force FA HQ/FSE for attack with other assets.

REHEARSING COUNTERFIRE

5-148. Counterfire rehearsal synchronizes the counterfire fight with the scheme of maneuver and the sensor-to-shooter link. The S2 and/or targeting officer should rehearse the counterfire plan with the radar and intelligence sections. They should rehearse management of radar zones during different phases, using radio nets (digital and voice with cueing agents); decision points for movements and prepare to march order; times to be ready to radiate (cueing schedules); and reporting accumulated cueing.

COUNTERFIRE DRILL

5-149. The following paragraphs provide a scenario that describes possible TOC counterfire procedures. They focus on the interactions of the staff, which are most important in synchronizing the counterfire fight.

PLAN

5-150. During the MDMP and wargaming processes the maneuver and FA battalion staffs identified counterfire, targeting, and TA data, requirements, and responsibilities. The OPORD, FS annex, FASP appendix and TA tab provide all necessary information. All FA assets are in place, ready to support the mission. The battalion has an attached Firefinder radar.

ACQUIRE

5-151. As the battle begins, the radar acquires enemy artillery firing from a CFFZ. The radar section assigns a target number from its allocated block of numbers and immediately calls in the counterfire information grids (impact and origin).

DECIDE

5-152. The O&I section receives the radar fire mission digitally or by voice. The automated FD system operator or radio operator sounds off with “fire mission, radar” or a similar SOP phrase to alert the FDC. (For a basic radar acquisition (ATI:CDR) the operator would sound off with “radar acquisition” or a similar, by SOP, phrase and the information processed to determine what action was required.) Then he announces target number, origin and impact grids and time acquired to the S2 and assistant S3. The FDO immediately sends a fire mission to the battery(ies), with a fire order of “AMC” for MLRS, or “do not load” (DNL) for cannons. The assistant S3 and S2 plot the grids. The assistant S3 makes a quick map spot, determines if units are in range of the target and informs the S3. The S2 begins to verify his template and identify the type unit(s). The S3 requests clearance of fires through the FSE, if necessary. The FSE clears the fires (through maneuver channels) and the FDO cancels “DNL.”

DELIVER

5-153. The FDO fires the mission and requests additional fires from the force FA HQ, if necessary. If attack criteria is achieved, the S3 directs end-of-mission (EOM) on that target. Alternative actions the S3 may direct are:

- **Handoff.** The battalion may be forced to handoff the mission to force FA HQ or FSE if it cannot service the mission.
- **End of Mission.** The S-3/FDO may have to direct EOM before the mission is fired because FSCMs or boundaries are violated and clearance cannot be granted in a timely manner, clearance of fires is denied, or there is a duplication of missions.

ASSESS

5-154. The O&I section coordinates with maneuver and force FA HQ to receive BDA. The S2 updates logs and revises enemy artillery positions based on origin grids, and revises enemy most likely COA based on impact grids. The targeting officer evaluates the S2's revised enemy artillery positions and recommends refinement to the radar zones (in coordination with targeting officers in higher/supporting headquarters). The S2 may also need to update the RDO, make cueing schedule changes, move the radar, and arrange for coverage during movement. The S3 may also need to relocate firing elements.

THEATER MISSILE DEFENSE (TMD)

5-155. TMD is a joint mission, accomplished by establishing an effective battle management/command, control, communications, computers, and intelligence (BM/C4I) system that permits the joint force commander to integrate and enhance the joint force's capabilities to:

- Destroy theater ballistic missiles (TBMs) in-flight (active defense).
- Reduce the vulnerability of friendly force and critical assets from the effects of theater missile attacks (passive defense).
- Destroy hostile theater missile capability by offensive actions against missile launchers; C4I; and logistics facilities; and other theater missile infrastructure (attack operations).

5-156. Army FA plays a key role in TMD attack operations by supporting TA operations and by executing deep fires to attack all elements of the hostile TBM system. This mission is primarily conducted by rocket/missile units under the control of corps, joint task force (JTF), or other echelon above corps commands. However, in smaller theaters or during deep, rapid maneuver penetrations, TBMs may periodically be within the ranges of cannon or rocket systems. Firefinder radar support for TMD, currently limited by range capabilities, will improve as newer, increasingly capable radars are fielded.

CONSIDERATIONS

5-157. FA participation in TMD attack operations is in essence a counterfire operation. However, sensor-to-shooter response times are especially critical in TMD operations as TBMs usually displace immediately after firing. Also, TMD sensor-to-shooter coordination is frequently more complex because of the number and type of TA/intelligence/communications assets involved, and the extreme distances between sensors, shooters, and C2.

5-158. FA weapons and TA systems supporting TMD operations are frequently in a dedicated role, making them unavailable for other support. TMD support may be part of a battalion's standard FA tactical mission

(normally a unit in a GS role), or may be assigned as a non-standard mission. Because of the complexity of TMD support, FA battalion commanders must ensure that responsibilities are clearly defined as the responsibilities inherent in standard FA tactical missions may not be appropriate.

5-159. While TMD support is usually a higher echelon operation involving only a few FA units, all FA units need to understand the attack guidances involved if TBMs are acquired as targets of opportunity. TBMs are usually high value/high payoff targets, attacked immediately upon detection. However, FA battalion S2s should have a thorough knowledge of the enemy threat and recent intelligence on NBC considerations. S3s, FDOs, and FSOs (where applicable) should understand the command's attack criteria and ensure that digital attack guidances reflect current, accurate information

5-160. Airspace management is a critical issue in TMD operations. While this is usually coordinated through FS channels, FA battalion commanders must understand the issues and ensure that their units both provide accurate unit data and receive and post all fire control measures.

SECTION IV – SUPPRESSION OF ENEMY AIR DEFENSES

5-161. SEAD involves all activities to neutralize, destroy, or temporarily degrade surface-based enemy air defenses (EADs) by lethal and non-lethal means. Effective SEAD increases friendly aircraft survivability, enhances air operations, and facilitates rapid US air superiority. This in turn supports the ground maneuver and counterfire battles. Army SEAD operations are primarily designed to support operational and tactical plans by protecting air assets near the FLOT or during cross-FLOT operations. However, the increasing range of FA weapons has extended the FA's ability to support increasingly deeper air operations.

5-162. The bulk of the planning, targeting, and coordination for SEAD support is usually done in FSEs. Both ground force FSEs and aviation unit FSEs may be working together in planning and coordinating SEAD for an air operation in support of the ground force. Additional information on SEAD can be found in FM 6-20, FM 6-20-30, and FM 6-20-40.

5-163. FA battalions DS to ground or aviation units may be very involved in overall SEAD planning and coordination due to the battalion commander's FSCOORD responsibilities. This includes planning and executions of both EFSTs and EFATs. SEAD responsibilities for other FA battalions may be limited to executing SEAD related EFATs. However, there may be instances where a GS, GSR, or R FA battalion plays a major role in the overall SEAD for an operation. In this situation, the FA battalion commander (and/or the S3) may go to the planning HQ or FSE and actively participate in the detailed SEAD planning. GS, GSR, and R battalions should also consider the possibility of establishing temporary liaison with the aviation or ground force FSE during the planning and execution of critical SEAD missions.

5-164. FA battalion involvement in SEAD may include:

- Planning, conducting, or participating in SEAD programs designed to degrade and suppress EAD assets throughout the zone or to destroy, degrade, and suppress EAD within a specific area or corridor.
- Planning, executing, or participating in SEAD fire plans designed to support specific air operations.
- Providing immediate fires to rotary or fixed-wing aviation assets in support of an ongoing air operation.

5-165. A SEAD plan or program may involve several FA battalions, with divisional cannons and MLRS providing fires along ingress and egress routes while corps MLRS units fire deeper SEAD fires. Early identification of air routes and attack by fire (ABF) areas is crucial in focusing TA assets and intelligence templating efforts, in developing attack plans, and in coordinating air corridors and ACAs with FA positioning requirements.

5-166. One technique for localized SEAD for a deep attack is to prep the ABFs with FA fires before occupation by the attack helicopters. MLRS fires are well suited for this role and may prep all ABFs simultaneously. Time separation is critical to preventing fratricide and to allow the helicopters to occupy the ABFs unopposed. The unit should fire the ABF prep based on an H-hour with the last rounds impacting from one to ten minutes before the

aircraft arrive in their ABFs. Terrain and weather conditions must be taken into account since large amounts of dust and debris may disrupt the aircraft's ability to begin locating and engaging targets in the engagement area.

5-167. FA fires can also be used to orient the attack aircraft to the engagement area. They should be fired as the aircraft are arriving in their ABFs and are establishing situational awareness. The EA prep serves two purposes. First, it suppresses the enemy elements that are the target of the attack and therefore any EADs that are accompanying them. Second, the flashes from the munitions provide the air crews with a visual reference of the location of the targets.

5-168. SEAD targets should be fired during egress in the same fashion as the ingress targets. Any targets discovered during ingress should be included in the egress program. The egress SEAD should be fired on-call if the attack aircraft can communicate with the FSO. If all communications with the helicopters is lost during the deep attack, then the egress SEAD should be fired on a planned time schedule. This allows the aircraft to know when it is safe to proceed down their egress route without being hit by SEAD fires.

CONSIDERATIONS

5-169. The battalion S3 and FDO work closely with the appropriate FSE, maneuver S3, and higher FA HQ to maintain current mission data. They review SEAD EFATs (and EFSTs) to ensure firing units will be in position, on time, with the necessary ammunition, able to fire the missions. They review the relative priorities, potential mission conflicts, and enemy threats to better anticipate how alternative or backup plans must be executed. The S3 verifies who has triggering responsibility, who has what authority to change mission factors, and who he or the firing unit must contact if problems develop. He ensures the battalion FDO and firing units (primary and backup) are properly briefed in all aspects of the SEAD mission.

5-170. Firing positions must not interfere with established air corridors or restricted operating zones (ROZs). ROZs are areas where aviation unit C2 aircraft operate (frequently over friendly terrain). S3s should query FSEs or force FA HQ early to identify air corridors, ROZs, and ACAs.

5-171. The primary and backup triggers for each SEAD EFAT should be evaluated during rehearsals. Timing is frequently important in SEAD fires to prevent fratricide of friendly air and obscuration of the main target. Aircraft may arrive early or late, targeting information may not develop, or the FA firing unit may be unavailable, delayed, or involved in another mission. The S3 must be able to quickly decide whether or not to fire or abort the mission. Since aborting a FA SEAD mission can have serious impact on the air mission, wargaming analysis and prior coordination are critical to understanding the commander's guidances and priorities that should guide the S3's decision. The FA battalion commander may retain abort decision-making authority on critical SEAD EFATs.

5-172. Aerial observer procedures should be reviewed in case immediate fires are requested. Requirements for fixed-wing observers will be different than for helicopter-based observers. Individual requests by flight leaders (pilots)

for SEAD support are treated as targets of opportunity. These targets can be added to the current SEAD plan and fired during egress or during a re-attack of the target. The S3 and FDO must anticipate these missions, considering time, ammunition, firing units, and potential target types, and develop tentative fire orders for the more likely scenarios.

5-173. The S3 or FDO may have to recommend or make rapid adjustment to the SEAD fire plan to adjust for changing circumstances. When adjusting fire plans and servicing of immediate SEAD fire requests the S3 and FDO must carefully review the potential impact on other fires. Successful execution of adjustments depends on a complete understanding of the commander's intent, priorities, and the concept of operations, and a thorough review of branches and sequels during planning will facilitate these adjustments during execution, and accurate situational awareness (operational and CSS).

5-174. Smoke may be used to obscure enemy air defenses or to signal the lifting or shifting of fires to allow aircraft to attack. The S3 should ensure the use of smoke is well coordinated.

5-175. The S2 works closely with targeting officers in the FSEs and with S2s in maneuver, aviation, or higher FA HQ to ensure the battalion has the most current targeting information. If the battalion performs SEAD targeting, the S2 must submit requests for SEAD related intelligence and targeting information as early as possible. Direct coordination with aviation, air force, and MI elements may be necessary to get accurate information in a timely manner. The battalion S2 or targeting officer in a FA battalion may briefly move to the FSE responsible for planning SEAD support to an operation.

5-176. SEAD targets include C2, ADA weapons, and radars. Often, one C2 facility or radar will service several EAD weapons and are thus key targets. Because of the ranges involved in supporting deep operations, target locations must be as accurate as possible. During coordination of SEAD targeting, FA battalion S2s and S3s should discuss target location accuracy with FSEs when they identify potential problems.

5-177. The sources for development of SEAD targets in the close battle area are primarily visual observation by ground and air observers, electronic and imagery assets, or templating techniques. SEAD targets supporting deep air operations are provided primarily by Air Force tactical air reconnaissance flight reports, other aircraft reports, or satellite imagery available through corps and echelons above corps intelligence coordinators, all of which may require more coordination and/or special communications or automation arrangements.

5-178. The S6, working with the S3, reviews SEAD EFATs for unique communications and automation requirements. Due to the varied C2 arrangements, participants, and distances involved unusual communications arrangements may be necessary. Retrans or relay of voice and digital traffic may be necessary. Additional communications equipment may be warranted. Quickfire channels may be used. The battalion S6 may need to work directly with a ground or aviation force FSE to ensure communications arrangements are adequate. Alternate (backup) communications plans should be developed.

SECTION V – METEOROLOGY

5-179. Met data are one of the prerequisites for accurate predicted fire. With today's emphasis on first round fire for effect and trends toward longer distances, accurate met corrections for artillery fires are crucial to:

- Conserve ammunition.
- Decrease time in adjustment.
- Obtain a greater surprise effect.
- Reduce the potential for fratricide.

5-180. FA met involves the determination of current atmospheric conditions. Atmospheric conditions along the trajectory of a projectile or rocket directly affect its accuracy and may cause the projectile or rocket to miss the desired point of impact. A 5 to 10 percent effect on the firing tables is possible even with stable atmospheric conditions. For example, tests in Southwest Asia have shown that firing artillery at maximum ranges in extreme heat and low air density resulted in met corrections up to 4,700 meters.

5-181. While most FA battalions are primarily receivers and users of met information, FA battalions in separate maneuver brigades have an organic met section, and thus a responsibility for management of met operations. This includes preparation of the met plan as a part of the FASP/FSP (An example of a met tab is in Appendix A). During contingency or stability and support operations, any FA battalion could potentially have a met section attached. Detailed information on FA met is in FM 6-15, while use of met in gunnery solutions is covered in FM 6-40.

JOINT/COMBINED MET CONSIDERATIONS

5-182. During joint and combined operations, an FA battalion may need to rely on non-US Army met support. The following information will assist the FA battalion in understanding met availability in joint and/or combined operations. Requests for met support from joint or combined met elements should be coordinated well in advance. In coordinating this support the S3 should request assistance from corps or division met personnel to ensure that the data can be received in a useable format, that it will be conducted within the appropriate area, and that it will be provided on the needed schedule.

Joint Operations Met

5-183. The US Air Force (USAF) has numerous fixed and deployable weather teams deployed throughout the world capable of performing upper air soundings. The information they gather cannot be used for ballistic solutions to the gunnery problem. The FA battalion S3 should understand that the presence of a USAF met team does not provide a ballistic met capability.

5-184. The US Navy has mobile environmental teams capable of sounding he atmosphere and producing ballistic data. The message produced is in STANAG format. These teams are deployed on a mission basis. They typically support their own units, but also support joint operations and could be requested to support US Army artillery operations.

Combined Operations Met

5-185. The US and several of its allies have agreed on standard met message formats that allow the exchange of atmospheric data among member countries with the assurance that the same atmospheric standards were used. Combined force artillery commanders and S3s may be able to assist the FA battalion with met issues.

BASIC MET GUIDANCE

5-186. The basic decisions concerning met data involve the following:

- Verifying that the met message is free of major errors.
- Determining which met message to use when multiple messages are available.
- Determining how long the met message can be used before the data may no longer be valid.

5-187. Guidance is normally provided by TSOP or in the force FA HQ met tab of the FASP in the division or corps FSP. However, at times the FA Bn FDO, or the battery/platoon FDOs may need to make the key decisions concerning met usage. The general order of preference for determining which met data should be used is as follows:

- Current met message from a station within 20 km of the firing point.
- Current met message from the nearest station more than 20 km from the firing point.
- Met messages more than two hours old but from a station within 20 km of the firing points. A 4-hour old met message may be used except when day/night transitions or frontal passages are occurring.

MET MESSAGE VALIDITY CONSIDERATIONS

5-188. The validity of a met message decreases with time, distance, and weather. The accuracy of a met message decreases as the distance from the met sounding site increases. Local topography has a pronounced effect on the distance that met data can be reasonably extended. In mountainous terrain, or near large bodies of water, distinct variations in atmospheric conditions occur over short distances. Met messages for artillery are considered valid 10 to 20 km from the balloon release point depending on the nature of the terrain.

5-189. The passage of time decreases the accuracy of a met message because of the changing nature of weather. There are no specific rules for determining the usable time, since that determination will depend on the characteristics of the atmosphere, periods of transition, met section movement, personnel, supplies and equipment, and the altitude. Generally, the more the weather changes, the less valid the met becomes.

REGISTRATION

5-190. If the current applied met appears invalid and a valid met is not available the S3 and FDO should consider conducting a registration or using residual data from an adjust fire mission until a valid met is available.